

**What is claimed is:**

1. A friction stir welding apparatus of a piston for a swash plate type compressor with variable capacity, the friction  
5 stir welding apparatus comprising:

the first and second supporting parts(31a and 31b) mounted on the top surface of a table(36), the first and second supporting parts rotatably supporting the first piston member(23) and the second piston member(26), the first piston member having  
10 a bridge(21) and a first coupling part(22) protruding from the bridge(21), the second piston member having a second coupling part(24) coupled with the first coupling part(22) of the first piston member(23) and a hollow part(25) formed by being coupled with the first piston member(23);

15 welding means(40) rotatably inserted into welding portions of the first and second piston members(23 and 26) supported by the first and second supporting parts(31a and 31b), for carrying out friction stir welding along the rotation direction of the first and second piston members(23 and 26);

20 support rollers(33) elastically mounted on the lower side of the first and second piston members(23 and 26) to arrange central axis lines of the first and second piston members(23 and 26) on central axis lines of the first and second supporting parts(31a and 31b) when the first and second piston members(23

and 26) are supported on the first and second supporting parts (31a and 31b), the support rollers(33) vertically moving within a predetermined height(H) range while supporting the first and second piston members(23 and 26); and

5        transferring means(38) for transferring the welding means(40) from the welded portions to a predetermined position after the friction stir welding of the welding portions by means of the welding means.

2. The friction stir welding apparatus according to claim  
10 1, wherein a guide member(60) for controlling position of the central axis lines is detachably mounted on the upper portion of the second supporting part(31b), and the guide member(60) exactly positions the central axis line of the second piston member(26) onto the central axis line of the second supporting part(31b)  
15 while pressurizing the upper surface of the second piston member(26) temporarily coupled to the first piston member(23), so that the central axis line of the first piston member(23) elastically lifted or lowered by the support rollers(33) is coincided with the central axis line of the first supporting  
20 part(31a).

3. The friction stir welding apparatus according to claim 1, wherein the transferring means(38) has a servo-motor(37) for transferring the table(36) to a predetermined distance in an axial direction of the piston.

4. The friction stir welding apparatus according to claim 1, wherein at least two the support rollers 33 are rotatably mounted adjacently with each other on a plurality of supporting member(34), which are mounted on the upper portion of a fixed stand(35) fixed on the upper surface of the table(36).

5. The friction stir welding apparatus according to claim 4, wherein the fixed stand(35) includes a vertical through-hole(51), and a ascent and descent member(53) connected with the lower surface of the supporting member(34) inside the vertical through-hole(51), the ascent and descent member(53) being elastically supported by an elastic spring(52).

6. The friction stir welding apparatus according to claim 5, wherein the ascent and descent member(53) has the lower portion protruding to the outside of a narrower path than the vertical through-hole(51), and the protruding end of the ascent and descent member(53) is inclined at a predetermined slant angle.

7. The friction stir welding apparatus according to claim 5, wherein a fixing means(70) is mounted under the ascent and descent member(53), the fixing means(70) for fixing the supporting member(34) by stopping the movement of the ascent and descent member(53) when the first and second piston members(23 and 26) are supported on the the first and second supporting parts rotation(31a and 31b).

8. The friction stir welding apparatus according to claim 6, wherein a fixing means(70) is mounted under the ascent and descent member(53), the fixing means(70) for fixing the supporting member(34) by stopping the movement of the ascent and descent member(53) when the first and second piston members(23 and 26) are supported on the the first and second supporting parts rotation(31a and 31b).

9. The friction stir welding apparatus according to claim 7, wherein the fixing means(70) includes: a wedge type fixing member(74) having the front end inclined like the end of the ascent and descent member(53), a horizontal through-hole(71) formed therein, and a movable rod(73) elastically supported by the elastic spring(72) inside the horizontal through-hole(71); and a connection member(76) connected to an end of the movable rod(73) protruding to the outside of the horizontal through-hole(71) of the wedge type fixing member(74).

10. The friction stir welding apparatus according to claim 8, wherein the fixing means(70) includes: a wedge type fixing member(74) having the front end inclined like the end of the ascent and descent member(53), a horizontal through-hole(71) formed therein, and a movable rod(73) elastically supported by the elastic spring(72) inside the horizontal through-hole(71); and a connection member(76) connected to an end of the movable

rod(73) protruding to the outside of the horizontal through-hole(71) of the wedge type fixing member(74).

11. The friction stir welding apparatus according to claim 9, wherein an air cylinder(77) is connected to an end of the connection member(76), and moves the connection member(76) back and forth, so that the wedge type fixing member(74) is advanced to or returned from the end side of the ascent and descent member(53) by the connection member(76).

12. The friction stir welding apparatus according to claim 10, wherein an air cylinder(77) is connected to an end of the connection member(76), and moves the connection member(76) back and forth, so that the wedge type fixing member(74) is advanced to or returned from the end side of the ascent and descent member(53) by the connection member(76).

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